

CLAIMS

1. In a system for manufacturing a three-dimensional object by deposition of molten material drops on a substrate, an apparatus for producing said molten material drops comprising:

- 5 a crucible for holding a reservoir of molten material;
 a conically-shaped orifice having a fixed outlet diameter disposed in the bottom of said crucible through which a jet of said molten material flows towards said substrate; and
 an oscillating mechanical member for breaking said flow of molten material into said molten material drops, said member having a conically-shaped head for cooperating with said orifice and for varying the effective size of said orifice, said conically-shaped head comprising a slanted radial portion and a tip portion extending through the orifice, the effective diameter d_{eff} of said orifice and said jet being defined by the equation $d_{eff} = [d_0^2 - (\delta \tan \theta)^2]^{1/2}$, wherein d_0 represents said fixed outlet diameter, δ represents the amount of said tip portion extending through the orifice, and θ represents a slant angle corresponding to said slanted radial portion.

2. The apparatus according to claim 1, wherein said crucible comprises:

- a first annular surface extending radially from the center of the crucible having an elevation h_0 above the lower surface of said crucible, and an outer contour defined by a first diameter d_1 greater than d_0 ;
 a second annular surface extending radially from the center of the crucible having an elevation $h_1 + h_0$ above the lower surface of said crucible, an inner contour defined by the first diameter d_1 , and an outer contour defined by a second diameter d_2 greater than d_1 ; and
 an outer cylindrical wall having an inner contour defined by the second diameter d_2 .

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3. The apparatus according to claim 1, wherein said oscillating mechanical member oscillates at a frequency f_{opt} defined by the equation $f_{opt} = 0.225 U_j / d_{eff}$, wherein d_{eff} is the effective diameter of said jet and U_j is the velocity of said jet through said orifice.

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